

High resistance grounding for oil production applications

Allows for continuous operation and increased safety during ground fault conditions



HRG
Optional stainless steel cabinet shown

Eaton's high resistance grounding units help reduce high transient voltages that can result in:

- Motor failure
- Down-hole sensing equipment failure
- Cable insulation failure
- Penetrator failure
 - Packer penetrator failure
 - Step-up transformer failure

Seventy percent of all faults start out as arcing ground faults. High resistance grounding (HRG) is a long proven technology for surface systems used to protect ungrounded electrical systems and equipment from ground faults. When an HRG unit is applied to an electrical system, you have the benefit of a ground protected system without necessarily impairing the continuity of service. When it is determined that there is a ground fault on the system, where the fault is down hole, the HRG unit can alarm or, if desired, trip the system. If the location of the fault is determined to be down hole and not in a classified wellhead area, the well can be run with the fault on it indefinitely. HRG technology is as close to an ungrounded system as you can get without the negatives of an ungrounded system.

Customized for oil fields

Eaton's HRG unit is specially customized for use in oil production operations. Each unit is application engineered to apply to your specific well requirements. It is designed with a small footprint to accommodate floor space problems. The unit can be a NEMA 1,3R, or 4X enclosure.

Rating and configuration

Eaton's HRG is offered up to 5kV with a nominal voltage taps of 1800V, 3000V and 4200V. This voltage range coupled with multiple resistor taps, work with all known electric submersible pumps (ESP) well configurations currently in the industry. It can be applied to delta or wye ungrounded three-wire distribution systems. Standard dimensions are approximately 24"W x 20"D x 97"H.

Protection from overvoltage conditions

The HRG unit protects against transient over voltages that may occur under arcing ground fault conditions. When a ground fault occurs on a system, high transient voltages can occur, which may cause more frequent equipment failure than if the equipment were grounded.

These transient voltages can escalate over time without any limit. When the overvoltage reaches about 500%-700%, the system insulation breaks down into a massive fault. The HRG system helps to reduce the escalation with respect to ground and permits the system to continue operating with the ground fault on it. All the while, the motor keeps operating.



ESP ground fault failure in wye point



ESP ground fault failure tandem section

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Eaton's HRG units can save you millions

Eaton's custom HRG units enhance safety and extend run time. Where wells normally would be required to be shut down / de-energized (for example, on platforms), the HRG technology safely allows continued operation.

Interface with down-hole sensor technology

When down-hole sensing equipment is utilized on a well, Eaton's HRG unit can be equipped with patented signal blocker circuitry. This signal blocker keeps the down-hole sensor signal from erroneously flowing through the HRG unit's ground connection and resulting in an incorrect alarm or trip condition. With the signal blocker circuitry to guard against possible nuisance tripping, the down-hole sensing equipment can use the power conductors as a signal path, thus eliminating the need for an expensive dedicated control cable for a single path. In order to save floor space on a platform, other manufacturer's down-hole sensing equipment can be factory installed in the HRG unit.



Outdoor HRG unit

Options

The base HRG unit can be purchased for either a wye or delta transformer as well as medium voltage variable speed drives. It can also be equipped with the following options:

- Signal blocker circuitry
- Space heaters
- Special paint
- SCADA Alarms
- Safety door interlocks
- Stainless steel cabinets
- Other options available upon request

Eaton's HRG benefits

- Greatly improves safety by controlling transient over voltages (due to arcing ground faults) to within equipment ratings—especially on platforms and "class 1, Division 1 (ANSI or IEC)" classified areas
- Provide continuous operation during ground fault conditions. Tripping option can also be applied
- Provides an alarm to advise personnel that a ground fault condition exists
- Includes an optional signal blocker that provides for operation under normal conditions such that down-hole sensors can be applied without the grounding effecting sensor/signal proper functionality
- Harmonically compensated for VSD applications

Eaton's HRG features:

- Wye or Delta step-up transformer versions available
- Free standing/skid mounted suitable for outdoor placement
- Application engineering to apply unit to specific well selected. Final testing of unit prior to shipment
- NEMA 4 enclosure for platform application; NEMA 1 or 3R also available. Stainless steel enclosures available for H2S environments
- Alternate variations are available upon request.

Benefits of working with Eaton:

- **Increased operational predictability:** Durable solutions, remote monitoring/trouble shooting designed to reduce need for planned maintenance and optimize equipment life cycles
- **Safety solutions that protect people, profit:** Patented solutions that greatly reduce arc flash in high-risk environments
- **Globally networked:** Eaton engineers and professionals are accessible and networked on a global basis to provide experience and expertise to solve tough challenges
- **Service capable:** Eaton's global business footprint means we can work with your business—wherever it operates—offering local engineering, project management and service providers to improve uptime and reduce costs
- **Applied expertise:** Application-specific experts with track record of solving unique problems
- **Broad offerings:** Unique mix of electrical, hydraulics and filtration components and assemblies to provide one standard where you need it and industry recognized safety solutions that are designed for harsh and hazardous environments

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